This memorandum consists of 11 pages.
PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and 'max' in the right hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/incorrect.

3. **If whole process is given when only part of it is required**
   Read all and credit relevant part.

4. **If comparisons are asked for but descriptions are given**
   Accept if differences/similarities are clear.

5. **If tabulation is required but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links is incorrect, do not credit. If sequence and links becomes correct again, resume credit.

9. **Non-recognized abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable. Indicate that the candidate's numbering is wrong.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognizable accept provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the National memo discussion meeting.
14. **If only the letter is asked for but only name is given (and vice versa)**
   No credit.

15. **If units are not given in measurements**
   Memorandum will allocate marks for units separately, except where it is already given in the question.

16. Be sensitive to **the sense of an answer, which may be stated in a different way**.

17. **Caption**
   Credit will be given for captions to all illustrations (diagrams, graphs, tables, etc.) except where it is already given in the question.

18. **Code-switching of official languages (terms and concepts)**
   A single word or two that appears in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited, if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.

19. **Changes to the memorandum**
   No changes must be made to the marking memoranda. In exceptional cases, the Provincial Internal Moderator will consult with the National Internal Moderator (and the External moderators if necessary).

20. **Official memorandum**
   Only memoranda bearing the signatures of the National Internal Moderator and the UMALUSI moderators and distributed by the National Department of Basic Education via the provinces must be used.
SECTION A

QUESTION 1

1.1
1.1.1 B✓✓
1.1.2 C✓✓
1.1.3 C✓✓
1.1.4 B✓✓
1.1.5 B✓✓
1.1.6 C✓✓
1.1.7 C✓✓
1.1.8 D✓✓
1.1.9 B✓✓
1.1.10 C✓✓ (10 x 2) (20)

1.2
1.2.1 Eustachian tube✓
1.2.2 Carbon footprint✓
1.2.3 Thermal✓ pollution
1.2.4 Aquous humour✓
1.2.5 Oestrogen✓
1.2.6 Luteinising hormone✓/LH
1.2.7 Cristae✓
1.2.8 TSH✓/Thyroid-stimulating hormone
1.2.9 Internal✓ fertilisation
1.2.10 Accommodation✓ (10 x 1) (10)

1.3
1.3.1 B only✓✓
1.3.2 B only✓✓
1.3.3 A only✓✓
1.3.4 B only✓✓
1.3.5 None ✓✓
1.3.6 A only✓✓ (6 x 2) (12)

1.4
1.4.1 Spermatogenesis✓ (1)
1.4.2 Testis✓ (1)
1.4.3 (a) 23✓ (1)
   (b) 23✓ (1)
1.4.4 - Crossing over✓
   - Random assortment of chromosomes✓ (any order)
   (Mark first TWO only) (2)
1.4.5 2✓ (1)
1.4.6 Sperm cells✓/spermatozoa/male gametes (1)
   (8)

TOTAL SECTION A: 50
SECTION B

QUESTION 2

2.1 2.1.1 (a) Epididymis✓ (1)
(b) Testis✓ (1)
(c) Vas deferens✓/sperm duct (1)

2.1.2 Stores sperm cells✓ (1)
(Mark first ONE only)

2.1.3 Sperm cells will not pass to urethra✓
to fertilise the egg✓
and hence he will not be able to have children✓ (3)

2.1.4 The HIV virus may still be passed on✓ during sexual intercourse
through the secretions of the accessory glands✓ (2)

2.2 - Sound waves are directed by the pinna✓
- through the auditory canal✓
- to the tympanic membrane✓/ear drum
- causing it to vibrate✓
- The vibrations of the tympanic membrane are transferred to the ossicles✓ in
  the middle ear
- which eventually causes the oval window to vibrate✓
- This sets up pressure waves in the perilymph✓
- Pressure waves are then transferred to the endolymph✓ in the cochlea
- This stimulates the Organ of Corti✓
- in the cochlea✓
- to convert this stimulus into a nerve impulse✓
- *which is then transported along the auditory nerve✓
- *to the cerebrum✓
- *where the sound is interpreted✓

Any 4+3* (compulsory marks) (7)
2.3 2.3.1 A reflex action is a rapid\textsuperscript{✓}, automatic response\textsuperscript{✓} to a stimulus. (2)

2.3.2 (a) Synapse\textsuperscript{✓} (1)
(b) Inter-neuron\textsuperscript{✓}/connector neuron (1)

2.3.3 It ensures that the impulse moves in one direction only\textsuperscript{✓}
It prevents continuous stimulation of the neurons\textsuperscript{✓}
It ensures that the impulse is transmitted from the sensory neuron to the motor neuron\textsuperscript{✓}
Any (1)

\textbf{2.3.4} A \rightarrow B \rightarrow C (2)

2.3.5 - The person will be able to receive a stimulus\textsuperscript{✓}
- but will not be able to respond to it\textsuperscript{✓} (2)

2.3.6

\textbf{Sensory/Afferent neuron}

<table>
<thead>
<tr>
<th>CRITERION</th>
<th>MARKS ALLOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caption</td>
<td>1 mark</td>
</tr>
<tr>
<td>Any 4 labels</td>
<td>4 marks</td>
</tr>
</tbody>
</table>
2.4 2.4.1 0.25 g/cm³

2.4.2 15 minutes

2.4.3 - Blood glucose level of a person with diabetes mellitus is higher than that of a normal person at all times.
- There is a greater increase in the blood glucose level of a person with diabetes mellitus after ingestion of glucose compared to the normal person.
- It takes longer for the blood glucose level to stabilise for the person with diabetes mellitus compared to a normal person.

Any (2x2) (Mark first TWO only)

2.4.4 - Because the person with diabetes mellitus does not produce insulin/is insulin resistant
- therefore blood glucose is not converted to glycogen

2.4.5 - Glucagon
- Adrenalin

(Mark first TWO only)
QUESTION 3

3.1 3.1.1 The process by which the human body is able to maintain a constant internal environment

3.1.2 (a) Kidney
(b) Adrenal gland
(c) Aldosterone

3.1.3 - Walls of renal tubules
- become more permeable
- allowing for a greater re-absorption of sodium ions
- from the filtrate into the blood capillaries

3.2 3.2.1 Low number of species / low biodiversity

3.2.2 - Addition of phosphates caused eutrophication
- which led to an increase in algal growth / algal bloom
- which depleted the oxygen in the water
- thus reducing its ability to support a variety of life-forms

3.2.3 - The length of food chains will be reduced / complexity of food webs will be reduced
- resulting in organisms feeding on the remaining species having excess food
- leading to their overpopulation
- while organisms depending on the species that were lost will have less / no food available
- leading to their death / migration

3.2.4 - The use of living organisms
- to control the numbers of other organisms
3.3  3.3.1 China: 

\[ \frac{23}{100} \times 360^0 = 82.8^0 \]

European Union: 

\[ \frac{13}{100} \times 360^0 = 46.8^0 \]

USA: 

\[ \frac{19}{100} \times 360^0 = 68.4^0 \]

India and Russian Federation: 

\[ \frac{12}{100} \times 360^0 = 43.2^0 \]

Other: 

\[ \frac{33}{100} \times 360^0 = 118.8^0 \]

**NOTE:** If the wrong type of graph is drawn: marks will be awarded for 'caption only' 

- Leads to the enhanced 'greenhouse effect' ✓
- and thus global warming ✓
- Global warming influences the weather patterns ✓
- which can destroy habitats ✓
- leading to a decrease in biodiversity ✓

Any (3)
3.3.3 - It will be expensive\(\checkmark\) to change to machinery that produce less CO\(_2\)\(\checkmark\)
- Too expensive\(\checkmark\) to purchase or develop systems that remove excess CO\(_2\) from outlet gases\(\checkmark\)
- This will reduce profit\(\checkmark\) that will lead to job losses\(\checkmark\)/ have negative effect on the country’s economy

(Mark first TWO only) Any (2x2) (4)

3.4 3.4.1 Treatment\(\checkmark\) of plant shoot (1)

3.4.2 - Same type of plant\(\checkmark\)
- Placed in the same environment\(\checkmark\)
- Same amount of time\(\checkmark\)
- Tip removed at the same length\(\checkmark\)
- Same concentration of auxins\(\checkmark\)
- Same type of agar\(\checkmark\)

(Mark first TWO only) Any (2)

3.4.3 (a) - Shoot B would show upward growth\(\checkmark\)
- Auxins in the agar gel diffused downwards\(\checkmark\) into the shoot
- leading to cell elongation\(\checkmark\)

(b) - No growth in shoot C\(\checkmark\)
- Shoot tip contains NO auxins\(\checkmark\)

3.4.4 - Repeat the investigation\(\checkmark\)
- Use more than 1 plant per investigation\(\checkmark\)/increase sample size

(Mark first TWO only) Any (2)

TOTAL SECTION B: 80
SECTION C

QUESTION 4

- The zygote divides by mitosis✓
- to form a ball of cells✓
- called the morula✓
- More mitotic divisions of the morula occurs to form a hollow ball of cells✓
- called a blastocyst✓

- The blastocyst attaches to the endometrial lining✓
- The outer wall of the blastocyst, called the chorion✓,
  - develops projections called villi✓ which
  - embeds/implants✓ into the uterine wall

- The cells of the embryo continues to divide✓
- and differentiate✓
- to form the different organs and limbs✓
- and is now called a foetus✓
- The foetus is enclosed in a sac called the amnion✓
- filled with amniotic fluid✓
- which protects the foetus against temperature fluctuations✓
- protects the foetus against dehydration✓
- and protects the foetus against mechanical injury✓ /acts as a shock absorber

- The chorionic villi and the endometrium form the placenta✓
- where the blood of both the foetus and the mother✓
- run close to each other✓
- allowing for nutrients to diffuse✓ into the blood of the foetus
- The umbilical vein✓
- carries the absorbed nutrients from the mother to the foetus✓

Any (17)

Content: (17)
Synthesis: (3)

ASSESSING THE PRESENTATION OF THE ESSAY

<table>
<thead>
<tr>
<th>RELEVANCE</th>
<th>LOGICAL SEQUENCE</th>
<th>COMPREHENSIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>All information provided is relevant to the topic</td>
<td>Ideas arranged in a logical/ cause-effect sequence</td>
<td>Answered all aspects required by the essay</td>
</tr>
<tr>
<td>Only information relating to the development of the zygote to the foetus and its nutrition and protection is included (there is no irrelevant information)</td>
<td>Events that lead to the change from a zygote to a foetus are stated in the order in which they occur</td>
<td>ALL three aspects are included: 1. Development of zygote to foetus 2. Nutrition of the foetus 3. Protection of the foetus</td>
</tr>
</tbody>
</table>

1 mark | 1 mark | 1 mark

TOTAL SECTION C: 20
GRAND TOTAL: 150